REMARKS

Claims 1-33 are pending in this application. No claims have been amended by this Response. Claims 7-17 and 19-33 have been withdrawn by the Examiner. Applicants respectfully request that claims 12-17 be rejoined upon the allowance of claims 1-6 and 18. Claims 7-11 and 19-33 are drawn to non-elected subject matter and may be canceled by the Examiner upon allowance of the application. No new matter has been added.

Applicants appreciate the courtesies extended by Examiner Wood to Applicants' representatives during the May 18, 2010 personal interview. The following remarks constitute Applicants' separate Statement of the Substance of Interview.

Claims 1-6 and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over the article "Anomalous crystallization mechanism in the synthesis of nanocrystalline ZSM-5" to Van Grieken et al. in view EP 0 952 152 to Li et al.

Claim 1 recites a zeolite material of the pentasil type comprising an alkali metal and alkaline earth metal content of not more than 150 ppm and a molar ratio of Si to Al of from 250 to 1500, wherein at least 90% of the primary particles of the zeolite material are spherical and at least 95% by weight of the spherical primary particles have a diameter of less than or equal to 1 μm. Similar subject matter is recited in independent claim 18.

As appreciated by the Examiner, the applied citations fail to suggest a zeolite material that comprises the combination of all of the above-quoted features of independent claim 1. However, the Office Action asserts that a skilled artisan would vary the ratio of silica to alumina in the materials suggested in Van Grieken in view of Li to arrive at the claimed subject matter.

Applicants respectfully submit that the specification provides evidence of unexpected results that have been achieved with the claimed subject matter.

For example, a zeolite material of the pentasil type which, compared to materials of Van Grieken or Li exhibit improved properties. In particular, the specific pentasil type zeolite material as recited in instant claims 1 and 18, possess the specific combination of

(a) a very low content of alkali and alkaline earth metals which does not exceed 150 ppm,

(b) a high Si : Al ratio of from 250 to 1500, and

(c) a specific size distribution and morphology of the primary particles of the zeolite material having a diameter ofless than or equal to 1 urn,

which results in a very specific zeolite material that exhibits both higher catalytic activities and selectivities compared to zeolite materials which do not possess said specific combination of features.

More specifically, by way of example, the surprising experimental results can be demonstrated by applying the zeolite material in the preparation of tetraethylenediamine (TEDA) from piperazine (PIP) and ethylenediamine (EDA). In particular, as shown in Example 6 and in comparative Example 3 on pages 36 and 39 of the present application, a zeolite material of the pentasil type having a sodium content of less than 150 ppm (cf. Example 4 on pages 34 and 36, and results in Example 3) in addition to an Si : Al ratio and a primary particle size and morphology as respectively defined in claim 1, displays a higher conversion of EDA compared to a zeolite material having an alkali metal content which exceeds 150 ppm (cf. comparative Example 1 on pages 38 and 39, and results in comparative Example 3).

Furthermore, as shown in comparative Examples 4 and 5 on pages 39 and 40, a zeolite material displaying an Si : Al ratio in addition to an alkali and alkaline earth metal content as defined in claim 1, yet having edge lengths of the primary particles which exceed one micrometer, leads to a significantly poorer TEDA selectivity than a zeolite material displaying the specific combination of features recited in claim 1, as outlined above (cf. results in Examples 3, 6, and 9, respectively).

Consequently, the surprising technical effect of the present application results from the specific combination of features as recited in pending claim 1. In particular, as demonstrated in the description, the surprising technical effect is not achieved in the absence of any one of said specific features.

As agreed during the May 18 interview, evidence of unexpected results are grounds for a finding that a specific combination of applied citations would not have been obvious.

Applicants note that Van Grieken relates to the synthesis of nanocrystalline ZSM-5 zeolites, wherein, in particular, said document concerns alternative procedures for producing such nanocrystalline zeolitic material.

Specifically, in the introductory portion of Van Grieken, known crystallization processes for producing nanocrystalline materials of this kind are discussed in detail, including, for example, methodologies involving an increase in the SiO_2:Al_2O_3 ratio for achieving a decrease in the final particle size of the obtained material (cf. page 136, left column, 1st full paragraph).

As opposed to prior methodologies, Van Grieken suggests an alternative approach, wherein nanocrystallinity is achieved by a variation of various reaction parameters, including reducing the content of Na^+ cations present in the reaction mixture. In particular, Van Grieken suggests a decrease in particle size of the obtained crystalline material upon using compositions with a relatively low alkali content (cf. page 139, left column to right column, 1st full aragraph).

Thus, the specific combination of features recited in pending claim 1 is not rendered obvious by Van Grieken. In particular, as mentioned above, Van Grieken suggests the use of a low alkaline metal content in a reaction mixture as an alternative to employing e.g. an increased silica: alumina ratio for obtaining a product with a smaller crystal size and, in particular, for obtaining a nanocrystalline product. Van Grieken, however, does not suggest a combination of both a high silica: alumina ratio and a low alkaline metal content for the production of a zeolitic material. In fact, Van Grieken teaches away from such a combination because all examples taught therein employ a low silica: alumina molar ratio (cf. Tables 1-4 on pages 137-139,

respectively). Based on the teaching of said document, a person skilled in the art would therefore not have been directed to combining a methodology involving a high silica: alumina molar ratio with a methodology involving a low alkaline metal content of the reaction mixture.

Li relates to a process for preparing triethlyenediamine and piperazine by employing a ZSM-5 zeolite catalyst (cf. abstract). However, Li does not prepare the zeolitic material. Instead, the zeolite materials in Li were all obtained from commercial sources (cf. page 3, paragraph [0020]). Consequently, the zeolites disclosed in said document were produced according to the methods of the prior art, i.e., using conventional tetraalkylammonium hydroxide solutions and/or tetraalkylammonium salts in combination with an alkaline metal and/or alkaline earth metal hydroxide as the base (cf. page 3, paragraphs [0023] and [0024]), as a result of which they contain a conventional amount of alkali metal and/or alkaline earth metal.

In addition, Li places no particular limitation of the silica : alumina ratio in such zeolitic materials. Thus, it is only stated in said document that "If the silica/metal oxide molar ratio is less than 12:1, the yield ofTEDA and PIP may be undesirably low" (cf. page 3, 3rd full sentence). Thus, in addition to not teaching the use of a very low content of alkali metal and alkaline earth metals in a zeolite material of the pentasil type as defined in pending claim 1, there is also no pointer in Li with respect to the specific range of Si : Al molar ratios recited in the instant claims. Consequently, the subject-matter of independent claims 1 and 18 is not rendered obvious by Li.

Furthermore, the combination of Van Grieken and Li would also not direct the skilled artisan to a zeolite material of the pentasil type as recited in claims 1 and 18 because neither of these documents suggests the combination of a very low alkali metal and alkaline earth metal content in addition to a specific range of Si : Al molar ratios as defined therein, nor would a combination of the applied citations have directed a person skilled in the art to combine such features to obtain an improved zeolitic material as taught in the present application.

Claims 2-6 are in condition for allowance for at least their respective dependence on an allowable claim 1, as well as for the separately patentable subject matter that each of these claims recites.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 22-0185, under Order No. 17418-00041-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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